Title: Examining sub-auroral ion outflows in the TIDE data set
PI: Dr. Andrew Nagy
CoIs: Dr. Janet Kozyra and Dr. Michael Liemohn

Statement of Work:

It is proposed to examine the Polar-TIDE data set for observations of ions contributing to the stormtime ring current. TIDE, the thermal ion dynamics experiment, shuts off during the passage through the inner magnetosphere. This cutoff generally occurs around L=6. However, this leaves observational overlap with the outer ring current region. More significantly, it overlaps with the L shell of the geosynchronously-orbiting spacecraft operated by the Los Alamos National Laboratory (L=6.6), and therefore conjunctions and statistical correlations can be conducted between these two data sets. Of particular interest here is the quantification of the sub-keV ion population observed by the LANL satellites. They are ubiquitous in the LANL data throughout the nightside, especially during storms, and are not reproduced from a bi-Maxwellian (or bi-Lorentzian) moment reconstruction of the distribution function (see Figure 1 below). They are strongest on the dawnside, as evident in the statistical study by Korth et al. [JGR, p. 25,047, 1999]. They have also been observed by the CRRES satellite [Collin et al., GRL, p. 141, 1993]. However, their source region and mechanism is still unknown (are they a low-energy tail of the plasma sheet population, an ionospheric outflow, or a magnetopause boundary layer plasma?), and their influence on the stormtime ring current is largely unexamined.

Three tasks are planned for this study:
(1) Examine nightside/dawnside L=6-8 TIDE observations to quantitatively describe this population.
(2) Find nightside/morningside field-line conjunctions of Polar and a LANL satellite to quantify the field-line distribution of this population.
(3) Use these observational findings as an input population to our kinetic ring current model (the Michigan version of RAM) for specific storm events to calculate their trajectories through the inner magnetosphere and their contribution to stormtime effects such as magnetic perturbations and thermal plasma heating.

While the entire TIDE data set will be considered, of particular interest is the recent years (especially last fall/winter) of data when the satellite apogee has precessed to lower latitudes, allowing TIDE measurements closer to the magnetic equator in this spatial region. The recent storms in October and November 2000 have been tentatively chosen for intensive examination.

From these tasks, it is hoped to address the issue of the source population of these low-energy ions as well as the influence of these ions during geomagnetic storms.

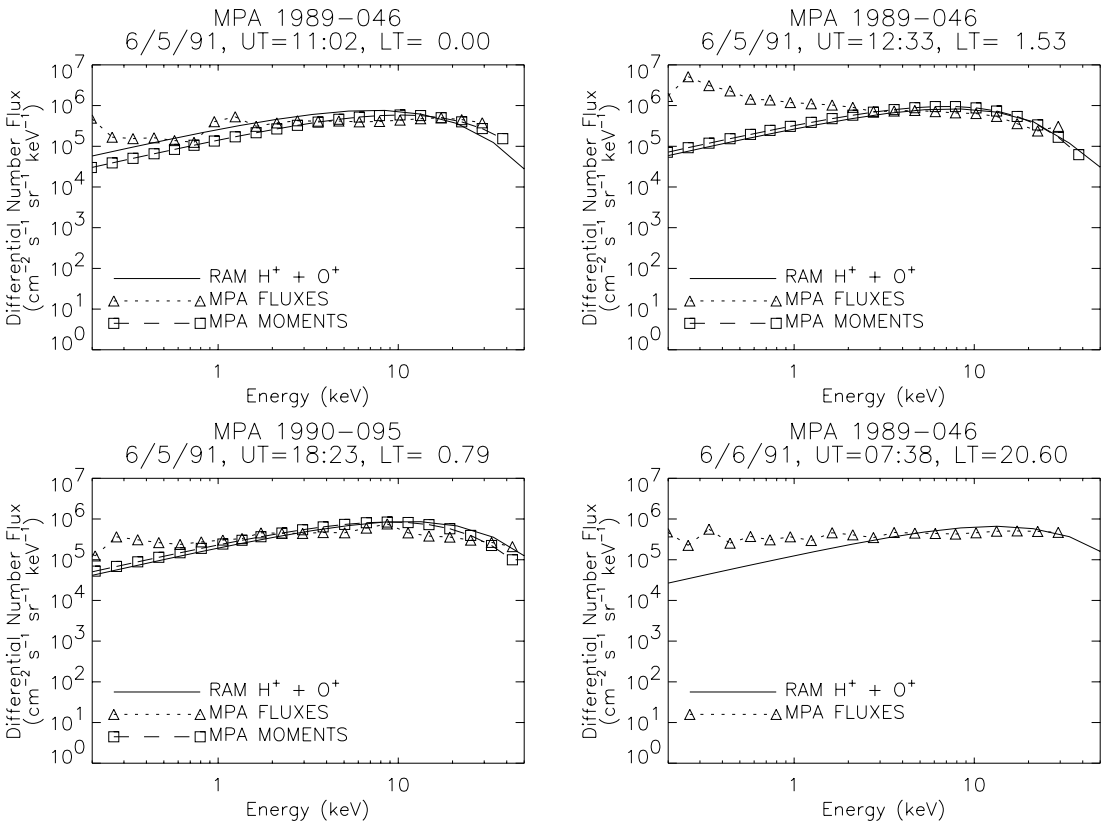

Figure 1. Energy spectra from the magnetospheric plasma analyzer during the June 1991 magnetic storm. Also plotted are reconstructions of the spectra from the bi-Maxwellian moments of the data and also from the use of these moments in the RAM kinetic transport model.